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be "prime, integral, rational, triangles" having 9 for base and 3 for difference of the other two sides.

III.—When $d=5$, then $e=14$. In this case take $14q^2 \backsim p^2=2$; the least values of p and q are $p=4$, $q=1$, and we find the sides of the first triangle in this case to be 9, 60, 65.

IV.—When $d=7$, then $e=2$, and $2q^2 \backsim p^2=1$ will give the required results. Taking $p=1$, $q=1$, we find the sides of the first triangle to be 9, 10, 17.

II. Solution by the PROPOSER.

I. Let 9, $x-\frac{1}{2}$, $x+\frac{1}{2}$ be sides of a rational △.

Then $(x+4\frac{1}{2})(x-4\frac{1}{2})5\times4=\square$ of area. $5(x^2-20\frac{1}{4})=\square$.

Key $=\surd5=\frac{2}{1}, \frac{9}{4}, \frac{38}{17}, \frac{161}{72}, \frac{682}{305}, \frac{2889}{1292}$, &c.

$5\times4^2+1^2=81$,	I. △	9	40	41,
$5\times17^2+2^2=1449$,	II.	9	724	725,
$5\times72^2+9^2=26001$,	III.	9	13000	13001,
$5\times305^2+38^2=466569$,	IV.	9	233284	233285,
$5\times1292^2+161^2=8372241$,	V.	9	4186120	4186121, &c.

II. Let 9, $x-2\frac{1}{2}$, $x+2\frac{1}{2}$=sides of △. $(x+4\frac{1}{2})(x-4\frac{1}{2})7\times2=\square$.

$14(x^2-20\frac{1}{4})=\square$. Key $=\surd14=\frac{3}{1}, \frac{4}{1}, \frac{11}{3}, \frac{15}{4} \,..\, \frac{449}{120} \,..\, \frac{13455}{3596} \,..\, \frac{403201}{107760}$, &c.

$9\times15=135$,	I. △	9	65	70,
$9\times449=4041$,	II.	9	2018	2023,
$9\times13455=121095$,	III.	9	60545	60550,
$9\times403201=3628809$,	IV.	9	1814402	1814407,
$9\times12082575=108743175$,	V.	9	54371585	54371590, &c.

III. Let 9, $x-3\frac{1}{2}$ and $x+3\frac{1}{2}$=sides of △.

$(x+4\frac{1}{2})(x-4\frac{1}{2})\ 8\times1=\square$. $2(x^2-20\frac{1}{4})=\square$.

Key $=\surd2=\frac{1}{1}, \frac{3}{2}, \frac{7}{5}, \frac{17}{12}, \frac{41}{29}, \frac{99}{70}, \frac{239}{169}, \frac{577}{408}$, &c.

$5^2+2=27$,	I. △	9	10	17,
$12^2+3^2+0=153$,	II.	9	73	80,
$29^2+7^2+1^2=891$,	III.	9	442	449,
$70^2+17^2+2^2=5193$,	IV.	9	2593	2600,
$169^2+41^2+5^2=30267$,	V.	9	15130	15137,
$408^2+99^2+12^2=176409$,	VI.	9	88201	88208, &c.

P. S. BERG refers to the proposer's article on pp. 262-3 of August MONTHLY.

PROBLEMS.

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20. Proposed by G. B. M. ZERR, Principal of High School, Staunton, Virginia.

Find two integral numbers, whose sum, difference, and difference of their squares shall each be a square, cube and fourth power.

21. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.

Find (1) nine positive *integral numbers* in arithmetical progression the sum of whose squares is a *square number*; and (2) find nine integral *square numbers* whose sum is a *square number*.

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AVERAGE AND PROBABILITY.

Conducted by B. F. FINKEL, Kidder, Mo. All contributions to this department should be sent to him.

SOLUTIONS TO PROBLEMS.

10. Proposed by F. P. MATZ, M. Sc., Ph. D., Professor of Mathematics and Astronomy in New Windsor College, New Windsor, Maryland.

Upon a surface one foot square, a coin one inch in diameter is thrown at random; what is the chance the coin *touches* or *intersects* both diagonals?

I. Solution by Professor P. H. PHILBRICK, M. Sc., C. E., Lake Charles, Louisiana, and the PROPOSER.

Represent the diagonals of the given square surface by AA' and BB'. If the center of the coin fall within the square $C_1C_2C_3C_4$, (C_1, C_2, C_3, and C_4 being the center of the coin when it is tangent to the diagonals), one of the following conditions is fulfiled: (1) the coin may *touch* both diagonals, (2) the coin may *intersect* both diagonals, (3) the coin may *touch* one diagonal and *intersect* the other. Since these conditions are *co-ordinate* with respect to the conditions of the problem, the total number of favorable chances is represented by the square $C_1C_2C_3C_4$. The total number of chances is represented by the area of the given square $ABA'B'$. Hence the required chance becomes $C=\frac{1}{144}$.

II. Solution by Professor G. B. M. ZERR, A. M., Principal of High School, Staunton, Virginia.

Let $ABCD$ be the square. E, F, G, H, the centre of the coin when it is tangent to both diagonals.

Then if the centre of the coin falls any where on the square $EFGH$, it will either touch or fall upon both diagonals. If the center falls any where on the area $AKUPDOVNCMSRBQTLA$, except when upon the square $FFGH$, it will touch or fall upon one diagonal. If the centre falls any where upon the areas KUP, OVN, MSR, QTL it will neither touch or fall upon a diagonal. Let A=area of $ABCD=144$ sq. inches.

a=area of $EFGH=1$ sq. inch.

b=area of $AKUPDOVNCMSRBQTLA$ —area $EFGH$. ∴ $b=(48\sqrt{2}-9)$ sq. inches.